



Deep Space Climate Observatory (DSCOVR) Mission Briefing

Heliophysics Subcommittee Meeting

February 27, 2012

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Program Executive**



DSCOVR Background

Formerly, Triana mission

- Originally developed for STS launch
- L1 Lissajous orbit, Earth pointed, Sun oriented, 3-axis stabilized
- 570 kg observatory
- Fully integrated & qualified
- 1500-2000 hrs on most components
- Full environmental test program
- Stored in environmentally controlled clean room since 11/01
- 21 month development effort
- \$249M (full cost FY07 \$) mission expenditure through entry into "Stable Suspension"

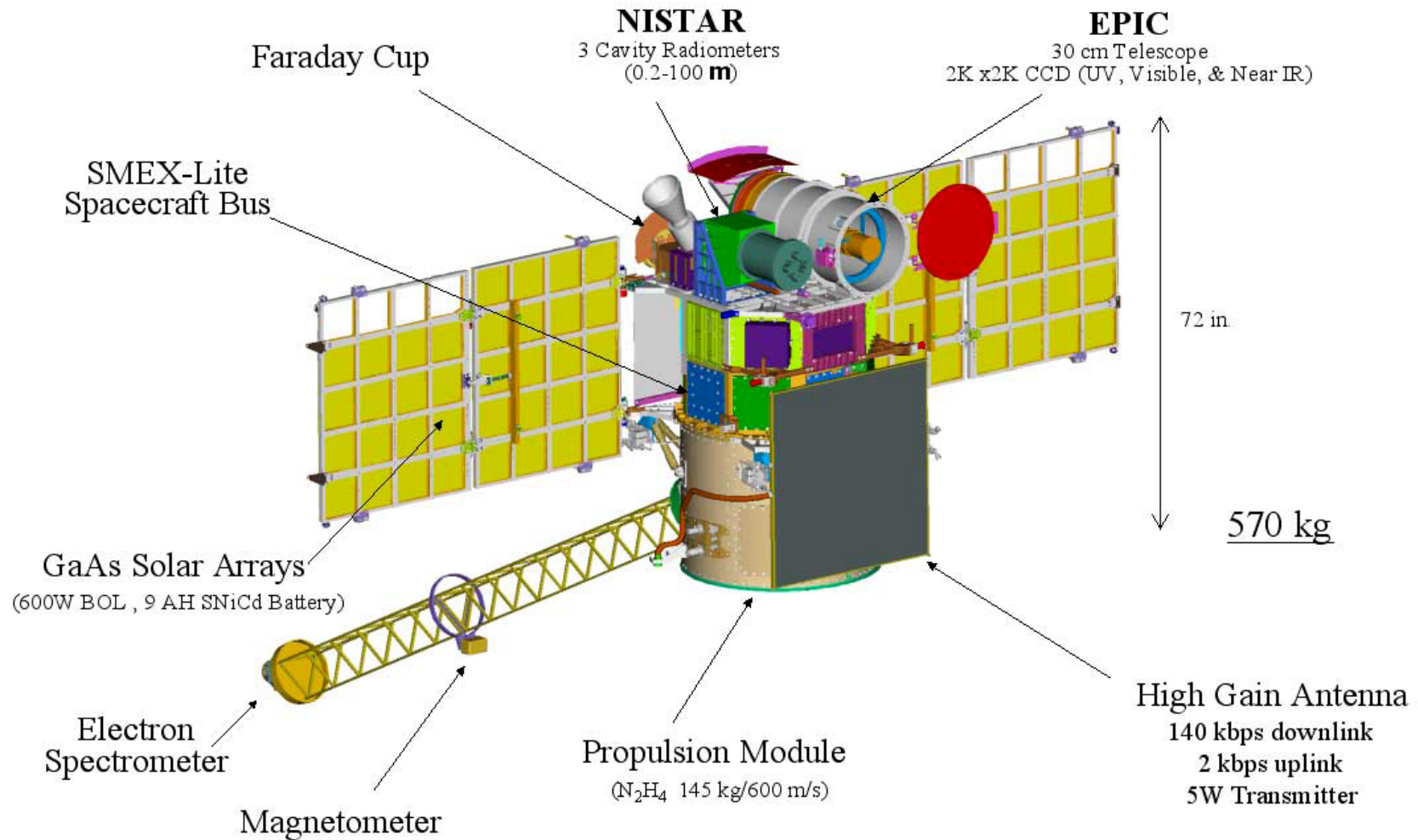


DSCOVR Science Objectives

Continue solar wind measurements in support of space weather requirements providing 3-dimensional distribution function of the proton and alpha components of the solar wind; 3-dimensional magnetic field vector and 3-dimensional electron velocity distribution. Secondary objective is to observe the Earth from the unique Earth-Sun L1 perspective. Tertiary objective is to measure the energetic particle environment.



DSCOVR Observatory



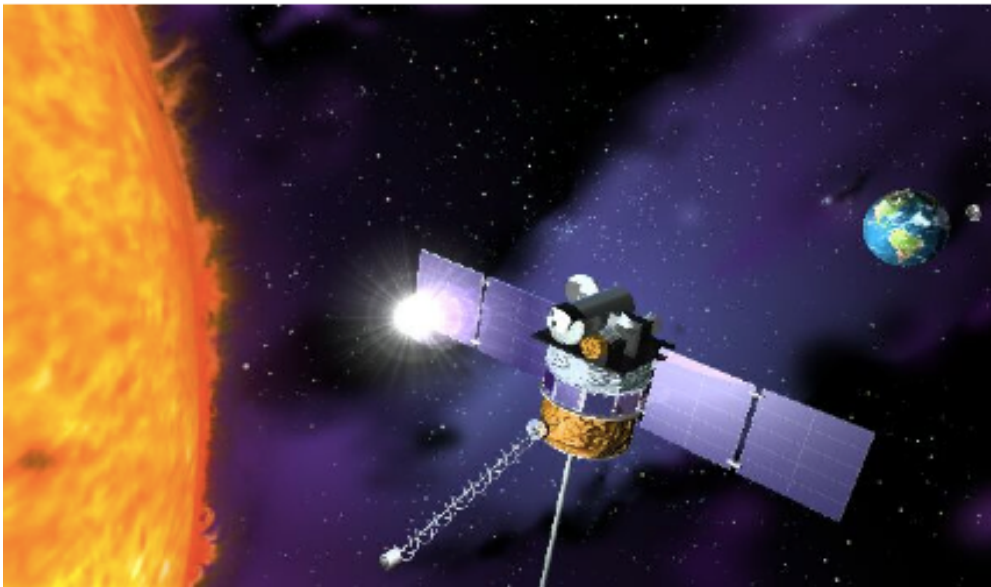


Timeline from Suspension to Project

- Under “Stable Suspension” in GSFC B29 since Nov. 2001
- GSFC Restart Study, June 2007
- GSFC “Serotine Report”, Jan. 2009 (funded by NOAA \$500k)
 - Included spacecraft aliveness test, 18 month schedule
 - \$47.3M cost estimate (w/o ops)
- NASA directed to refurbish the Earth Science Instruments, 2009-2011 (\$9M + \$5M, actual cost \$6.3M) – work now completed
 - Earth Poly-Chromatic Imaging Camera (EPIC)
 - NIST Advanced Radiometer (NISTAR)
- NOAA received \$31.1M appropriations in FY12 for DSCOVER, Sept. 2011
 - 2013 PPBE Submit estimated cost at \$63M; high-fidelity grass-roots estimate pending completion of planning phase IAA
- AF received \$134.5M appropriations in FY12 for DSCOVER LV, Oct. 2011
- DSCOVER Project officially started under GSFC’s Reimbursable Projects Program (RPP) Office; 6-month, \$2M planning-phase IAA started Oct. 2011
- Project Manager selected at GSFC, Jan. 2012
- Implementation-phase IAA will start in April 2012



DSCOVR Project under Reimbursable Projects Program (RPP) at GSFC



Deep Space Climate Observatory (DSCOVR)

Code 420

WBS: 949140

Phase: C

Launch Date: January 2014

Project Manager:	Albert Vernacchio
Deputy Project Manager:	Robert Smith
Deputy Project Manager / Resources:	Vacant
Senior Project Scientist:	Adam Szabo (Acting)
Chief Safety & Mission Assurance Officer:	Dann Brown
Mission Systems Engineer:	Vacant
Launch Vehicle Provider:	Air Force
Public Web Site:	TBS



DSCOVR's Primary Mission is Space Weather

Committee on Space Env. Sensor Mitigation Options (CSESMO) Report

- Recommended DSCOVR as the preferred option for the next generation solar wind mission
- Assigned agency roles
- Identified the DSCOVR PlasMag sensors as meeting the solar wind measurement requirement

Primary Mission Instruments required by NOAA (“Threshold Requirement”):

- Faraday Cup to measure the time-resolved 3-dimensional distribution function of the proton and alpha components of the solar wind plasma
- Fluxgate Magnetometer to measure the 3-dimensional magnetic field vector of the solar wind
- Note that Electron Spectrometer is **not** required by NOAA

Launch Vehicle will be provided by Air Force Space Command (AFSPC):

- AF has \$134.5M appropriations; DSCOVR Mission Manager selected
- IAA between AFSPC and NASA currently being developed
- LV to be provided under AF's Orbital Sub-Orbital 3 (OSP-3) contract (Sept 2012 contract award date). Estimated launch date July-Sept 2014.



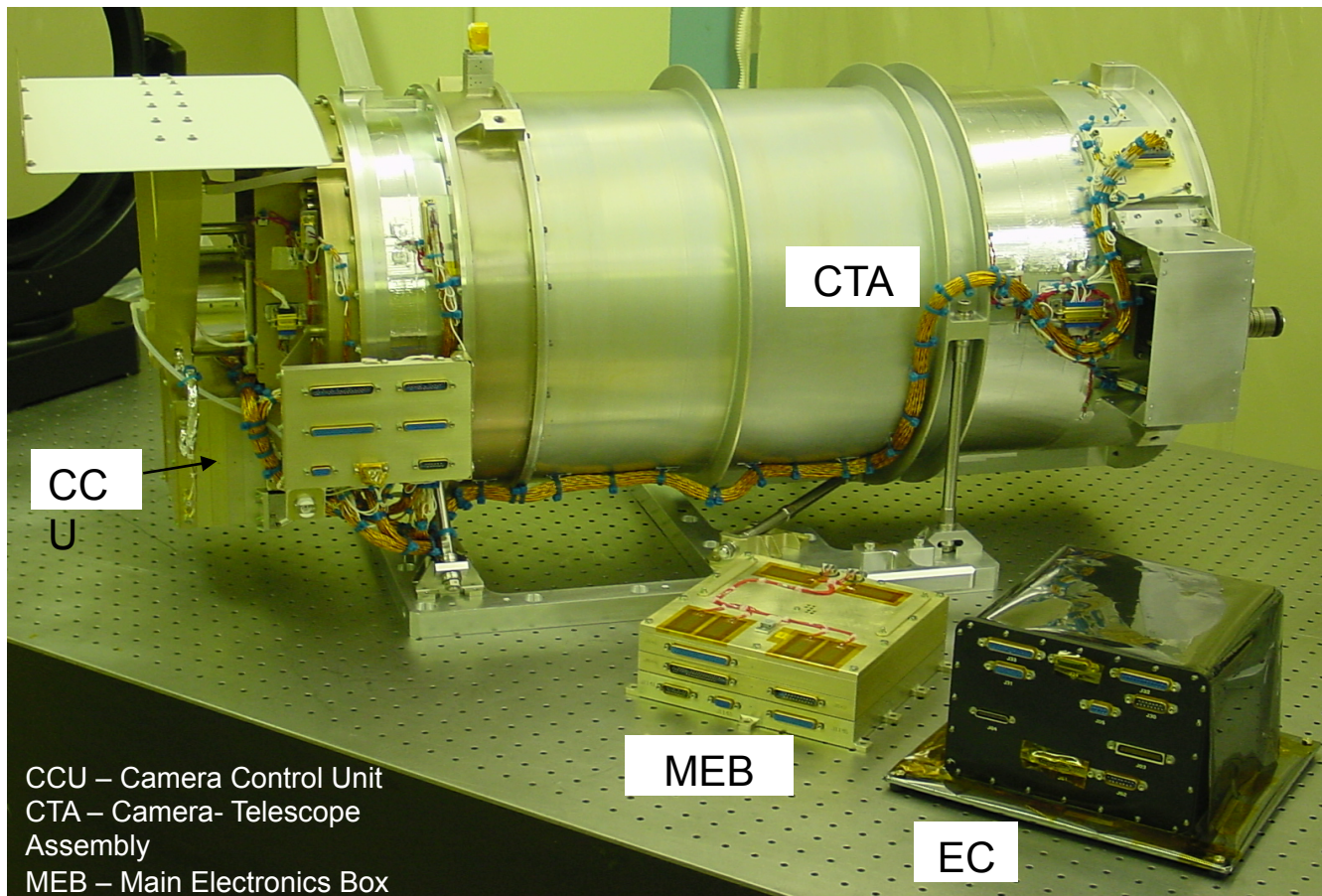
Legacy Instruments

Secondary Mission (“**Objective Requirements**” – optional):

- Earth Polychromatic Imaging Camera (**EPIC**)
 - Global Ozone Levels
 - Aerosol Index and Aerosol Optical Depth
 - Cloud Height over Land and Ocean
 - Vegetation Index and Leaf Area Index
 - UV Surface Radiation
 - Aerosol and Ozone Plume Tracking
 - NIST Advanced Radiometer (**NISTAR**) measures UV, visible, and IR reflected solar irradiance
 - **Electron Spectrometer** (electrostatic analyzer 3 eV to 3 keV range)
 - Pulse Height Analyzer (**PHA**) monitors effect of high energy particles on spacecraft electronics
- NASA does **not** have any appropriations to expend on DSCOVR, hence direction as to which instruments will fly are at NOAA’s discretion.



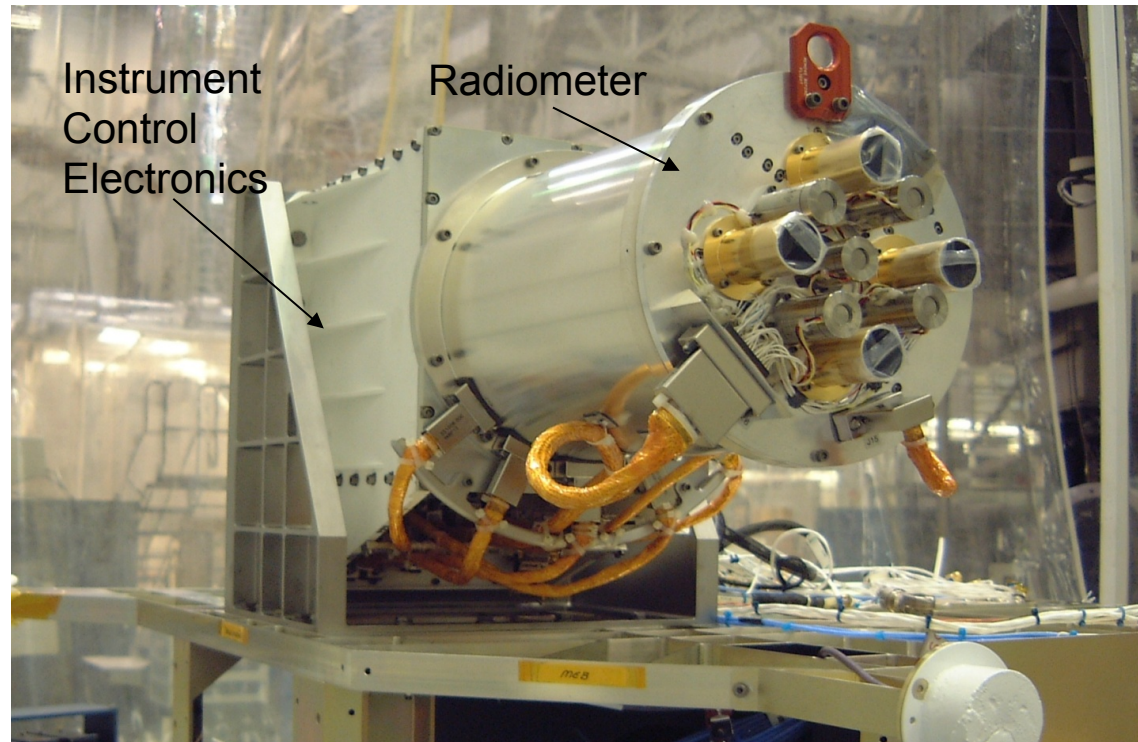
Earth Polychromatic Imaging Camera (EPIC)



Global spectral images of the sunlit side of the Earth.
Wavelength spans ultraviolet and near infrared.
4 megapixel CCD sensitive over entire wavelength with
8-14 km resolution.



NIST Advanced Radiometer (NISTAR)



Earth radiation data from 4-channel Radiometer

- visible to far infrared ($0.2\text{-}100\ \mu\text{m}$) channel to measure total radiant power in UV, visible, and infrared wavelengths
- solar ($0.2\text{-}4\ \mu\text{m}$) channel to measure reflected solar radiance in UV, visible and near infrared wavelengths
- near infrared ($0.7\text{-}4\ \mu\text{m}$) channel to measure reflected IR solar radiance
- photodiode ($0.3\text{-}1\ \mu\text{m}$) channel for calibration reference

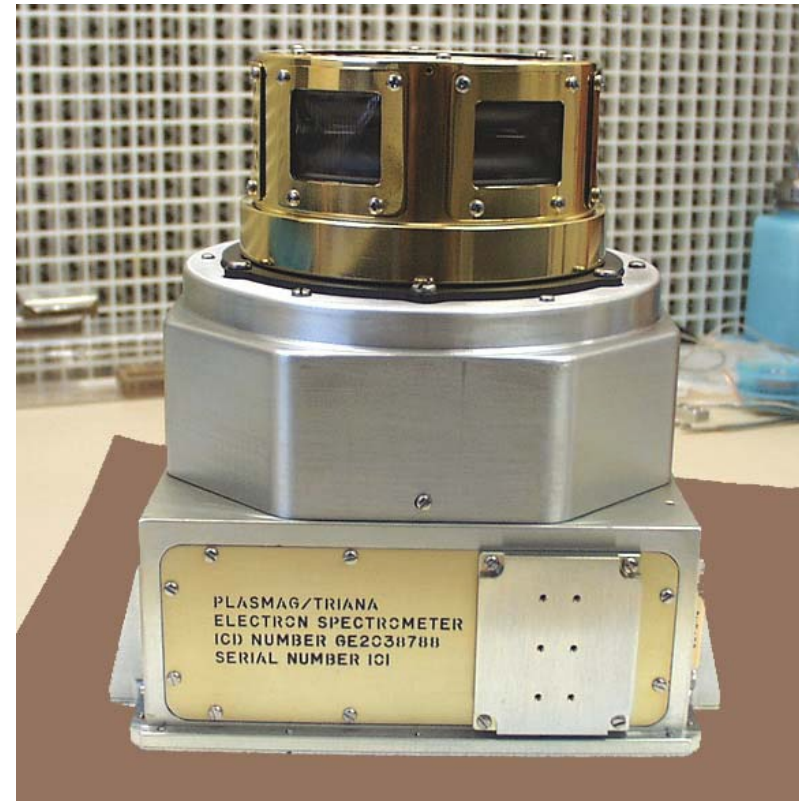
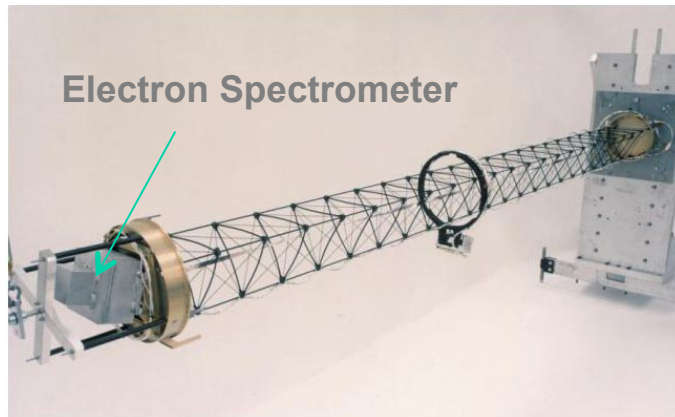


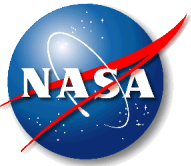
Electron Spectrometer

The top-hat electron spectrometer will provide high time resolution (<1 sec) solar wind electron, full 3D distribution function observations.

The electron spectrometer has a much higher velocity limit than the Faraday Cup.

While electron measurements have an inherently higher uncertainty, the Electron Spectrometer may extend space weather monitoring to unusually high speed events. The Electron Spectrometer sits at the tip of mag boom to gain a nearly 4π FOV.





Pulse Height Analyzer (PHA)

- Pulse Height Analyzer (PHA) instrument designed and built by GSFC
- Instrument previously flown on STS-95
- Small, low power, High Linear Energy Transfer Radiation Spectrometer (HiLRS)
- Evaluate Single Event Effects on microelectronics in the space environment
- Provides in-flight measurement of a spectrum of ionizing particle energy, charge, and mass
- Particle identification and a Linear Energy Transfer spectrum
- Provides real-time insight into particle events that may impact DSCOVR





DSCOV^R Legacy Instrument Options Summary

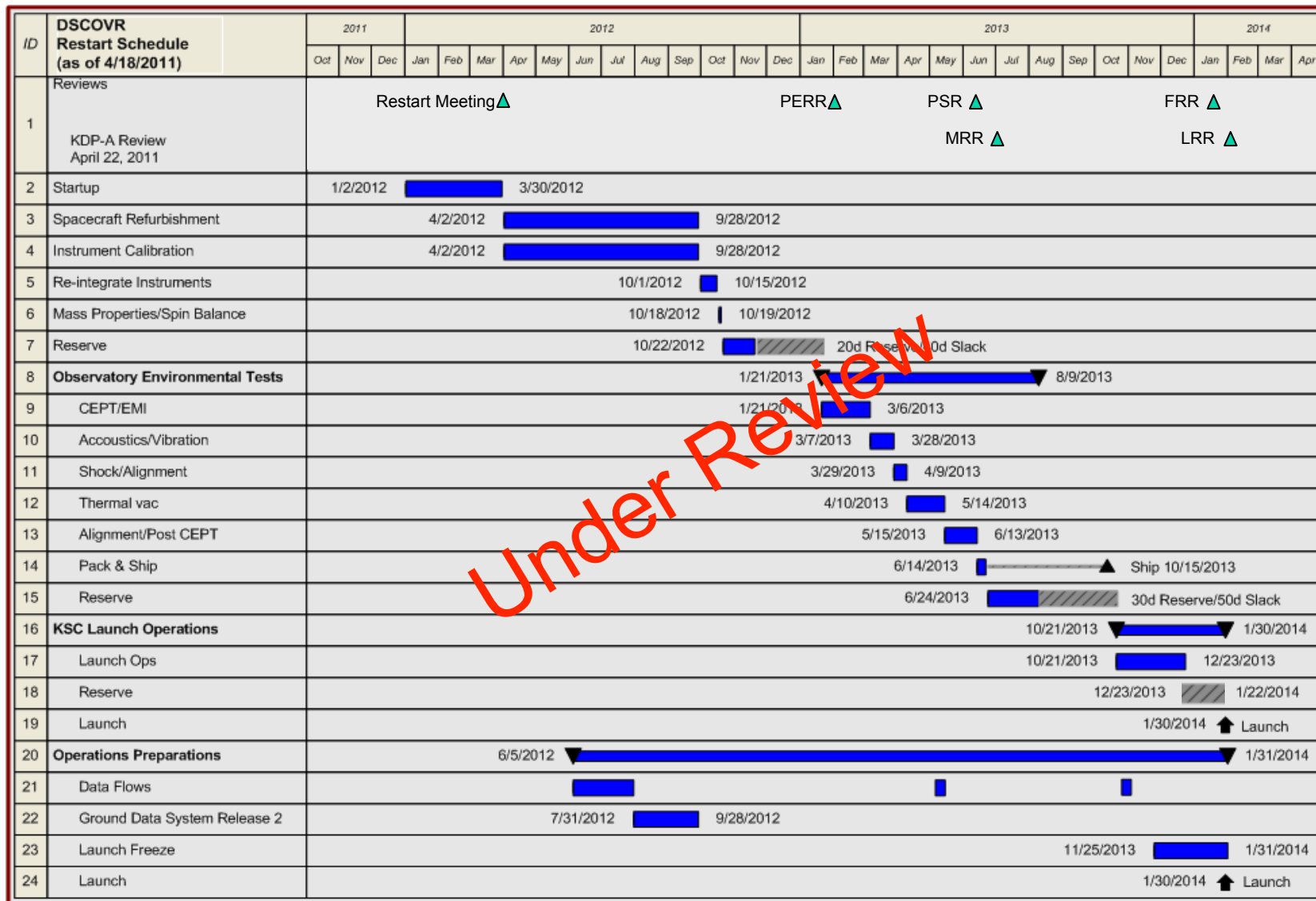
(Presented at NESDIS MSR on Feb. 9)

- **Functional** - Perform tasks necessary to completely integrate functional instrument
- **Mass Model** – Remove instrument and replace with mass model and thermal accommodations
- **Non-Functional** - Instrument would not be operable, as compatibility of operations with DSCOV^R systems and instruments will not have been demonstrated.



DSCOVr Master Schedule

Status as of: 1/31/12



27 Feb 2012

Nguyen



Immediate Tasks and Activities

- **Complete the hiring of project staff**
- **Completed implementation-phase IAA** – currently in signature cycle at NOAA; outstanding are which instruments will fly on DSCOVR.
- **Complete Level-1 Requirements Document** – draft of joint NOAA-NASA L1RD completed, under review by NOAA.
- **Complete AFSPC-NASA IAA for LV services** – draft IAA currently under review by AF.
- **Complete Magnetic Background Testing of DSCOVR** – to ensure compliance with L1 requirement for 2 nT background for magnetometer instrument.
- **Develop Concept of Operations with NOAA** – DSCOVR will be operated by NSOF after checkout is completed.
- **Complete grass-roots project cost estimate** – many assumptions since Serotine Report have changed significantly.
- **Develop Baseline Project Plan** – HQ is requiring joint NOAA-NASA KDP-C Review with tailored 7120.5 data products (summer 2012).



Questions & Answers

What is the availability of “science grade” data from DSCOVR?

- NOAA has a “blue skies” policy for the space weather data from the PlasMag instruments. All data is available to the public as soon as NOAA can get it to the archives. Additionally, SWPC undoubtedly posts to the web even faster. Data resolution, sampling rate, latency, etc. are specified in Level-1 Requirements.

What is happening with GSFC science involvement? Will there be a Project Scientist?

- Current plan is to have Adam Szabo be the Project Scientist (PS). If EPIC/NISTAR fly then Sasha Marshak will be Deputy PS. Former Triana scientists and PI's responsible for instruments will be funded to support integration and testing of particular instruments chosen by NOAA for flight.